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## THE VOLUME "*ICONES PLANTARUM ET ANIMALIUM*" IN THE AFRICANA MUSEUM, JOHANNESBURG; AND ITS RELATIONSHIP TO THE *CODEx WITSENII* QUOTED BY JAN BURMAN IN HIS "*DECADES RARIORUM AFRICANUM PLANTARUM*"

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### ABSTRACT

'*Icones plantarum et animalium*', a magnificent volume of 17th Century water-colour paintings, is somewhat of an enigma for there are no original headings signatures or dates. 'I.P.A.' includes over 300 studies of Cape Plants, and has been justly described by Kennedy, in his introduction to the "Catalogue of pictures in the Africana Museum" vol. 2, as of great importance in the history of South African Botany. The acquisition of this volume by the Africana Museum, and its subsequent recognition as a possible source for many of the figures in the '*Decades*' ends a widespread search in recent times for such a volume in the series of Dutch natural history paintings known as the *Codex Witsenii*.

### THE WITSEN CODEX

A vivid picture of the times and circumstances in which the Codex was compiled can be drawn from the writings of Waterhouse (1932), White and Sloane (1937), White, Dyer and Sloane (1941), Karsten (1939-1946, 1951, 1963-1967), Hutchinson (1946), Barnard (1947), Reynolds (1950), Smith (1952), Vogts (1958), Lighton (1960), Edwards (1964), Jessop (1965) and Kennedy (1967).

They tell of Heurnius, Hermann and other early explorers at the Cape, who brought back some of the bizarre and beautiful plants they encountered, returning to Leyden and other cities with material to stimulate the enthusiasm for the world of nature that was sweeping through Europe at that time. Oldenland and Hartog, Superintendents of the Dutch East India Company's Garden

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at the Cape, tended the wild plants gathered from far and near. These dedicated men propagated, pressed, preserved, described and catalogued an ever increasing collection of indigenous species, sending living material, seeds and information to the gardeners and botanists of Europe, where these plants were highly prized. Burman in 1737 published a catalogue of the plants collected by Hermann, Oldenland and Hartog as an appendix to his 'Thesaurus Zeylanicus'. Many of these are found in 'I.P.A.'

Herman Boerhaave, following Justus Heurnius and Paul Hermann at Leyden University, partook of their keen interest in the flora of South Africa. They passed on this enthusiasm to their pupil, Nicolaas Witsen. As a Director of the Dutch East India Company, and a trustee of the Hortus Medicus in Amsterdam, the illustrious Witsen was in a position to build up the collections of exotics in the Gardens and Herbarium. With the help of Jan Commelin and his nephew, Caspar Commelin, Witsen developed the Hortus Medicus in the tradition of the famous Gardens of Leyden.

Witsen commissioned the painting of the Cape and Batavian Floras, and some of this was done at the Cape from fresh material. Hendrik Claudius, apothecary and artist, portrayed plants and animals with fidelity. Tachard, the French Jesuit, and van Rheede tot Drakenstein, botanist and Company official, saw him at the Cape and took some of his work back to Europe. 'I.P.A.' has several distinct groups of pictures, probably done by different artists at different times. Some of the finest may be attributed to Claudius, and Kennedy catalogues the 'I.P.A.' paintings under his name.

Copies of the Codex pictures were made for favoured recipients: Compton, Bishop of London was given 100 studies of South African plants. Several sets of the series covering the famous expedition of Simon van der Stel to Namaqualand are known. 'I.P.A.' includes this series. A volume 'T.C.D.' in Trinity College, Dublin was described by Waterhouse (1932), and a similar one, 'S.A.M.' in the South African Museum, Cape Town by Barnard (1947). These and some unbound sheets in the S.A. Public Library, Cape Town, belong to the Namaqualand series. A companion volume to 'S.A.M.' in Pretoria was described by Jessop (1965). This has Cape flowers and no copies are known. Oostroom (1951) has reproduced studies of *Proteaceae* in Leyden that are replicas of 'I.P.A.' paintings. The Leyden sheets are presumed to be some of the originals used by Boerhaave for illustrations in his 'Index Alter Plantarum' (1720). Vogts (1958) considered the 'I.P.A.' paintings as possible prototypes for Boerhaave's figures (I.P.A. has almost all Boerhaave's *Proteaceae*), but some are simplified, and probably were copies made for Witsen to take to Amsterdam. Paintings of the Codex series are also housed in the British Museum, London, and other parts of the world. Boerhaave estimated there were over 1,500 paintings in the Witsen Codex.



Fig. 1. *Cinnamomum camphora* Nees and Eberm. "I.P.A." fol. 66.



Fig. 2. *Datura metel* L. "I.P.A." fol. 39.

Paintings in "I.P.A." of plants from the East, introduced to the Cape before 1700.



Fig. 3. *Maytenus acuminatus* (L.f.) Loes. Note badly-drawn inflorescence, matching "Decades" t. 97 fig. 3. "I.P.A." fol. 209.



Fig. 4. *Podocarpus latifolius* Thunb. Female inflorescence only, matching "Decades" t. 93. "I.P.A." fol. 73.

Species in "I.P.A." with corresponding illustrations in Burman's "Decades", not cited in Linné's "Species Plantarum".

Illustrations of South African plants matching paintings in the Codex have been recognised in various books. Tachard (1687) has a few of the Namaqualand series. Commelin (1701), adding an inflorescence to his picture of *Aloe plicatalis* Mill. grown in the Hortus Medicus, says it was taken from the Witsen Codex. This inflorescence can be matched with 'I.P.A.' fol. 5. Figures in the works of the two British botanists, Plukenet (1691-6) and Petiver (1702-9) are apparently formalised versions of Codex paintings. Weinman (1737), like Boerhaave (1720), had copies of Codex *Proteaceae* in his book; Burman (1738) has over 90 figures corresponding with 'I.P.A.' paintings; Breyn has figures like some in the Pretoria volume, and there is a *Euphorbia* picture taken from the Codex in an unidentified work of Buchoz (circa 1739). The illustrations are usually copper-plate engravings, reversed in printing, often simplified or made artistically more acceptable, leading in some cases to errors of interpretation. Weinman's pictures are hand-coloured and a good match of 'I.P.A.' colours except that his reds have preserved better than some in 'I.P.A.'.

Jan and Caspar Commelin were given custody of the Codex by Witsen, and after the death of Jan Commelin and Witsen, they were retained by Caspar until he too died. His widow gave three large volumes of the series to the young Amsterdam botanist Jan Burman who was quite overcome with this unexpected honour. They were kept and used by him and his son Nicolaas, but were eventually sold by Jan's grandson and lost to science.

Jan Burman's 'Thesaurus Zeylanicus', besides the Catalogue of Cape plants, has on the back of the last page an incomplete alphabetical list of exotics growing at the Cape. This includes the species *Datura metel* L. and *Cinnamomum camphora* Nees & Eberm., both beautifully illustrated in 'I.P.A.' and both annotated as Indian species. (Plate 1 figs. 1 and 2.) Nicolaas Burman in his 'Flora Indica' (1768) illustrates *Sium ninsi* L. with a figure t.29 Fig. I matching two uncoloured sketches fols. 280 and 282 in 'I.P.A.'

#### THE 'DECADES' AND THE CODEX

Jan Burman published the 'Decades' about 6 years after he received the three Codex volumes. He described and figured over 200 species of South African plants, and his text has frequent mention of the Codex. In the 97 plants associated with the Witsen Codex he also often refers to information in the Manuscript Catalogue of the Witsen Codex, prepared for Witsen by Caspar Commelin, and in most cases the figure in the 'Decades' can be matched with a painting in 'I.P.A.'. Certain species are related to a 'van der Stel Collection' of paintings. Many of the remaining species were described from material in the Witsen Herbarium, and where no clue is given, one often infers they were from this source; however they may have been described and figured from one of the Codex volumes without acknowledgement. It does not appear that





Fig. 5. *Celtis africana* Burm. f.: "I.P.A." fol. 72: "Decades" t. 88.



Fig. 6. *Oxalis pes-caprae* L.: "I.P.A." fol. 259: "Decades" t. 74.



Fig. 7. *Euclea racemosa* Murr.: "I.P.A." fol. 258: "Decades" t. 84 fig. 1.

Paintings in "I.P.A." with corresponding figures in Burman's "Decades". These figures are types of the species.

his pictures and his information were always taken from the same source. Sometimes he would say a plant was 'elegantly depicted' in a certain volume; more often he referred only to the notes accompanying the paintings, relating this information to descriptions in the works of Tournefort, Plukenet and many others.

The Waterhouse description of the volume 'T.C.D.' aroused interest in 'S.A.M.' as a possible source of some of Burman's illustrations in the 'Decades'. Dr. Luckoff looked for a painting to match a figure of *Stapelia variegata* L. in the 'Decades', described by Burman as beautifully illustrated in the van der Stel Collection. White & Sloane (1937) note that none was found. Barnard (1947) found 12 paintings in 'S.A.M.' to match 'Decades' figures associated with the Witsen Codex. He estimated that 92 came from this source and voiced the question where the remaining 70 paintings might be. Jessop (1965) noted that the volume in Pretoria had 6 paintings to match 'Decades' figures. One was the missing picture of *Stapelia variegata*; this and 4 others were associated with the van der Stel Collection, and one, *Oxalis purpurea* L. with the Witsen Codex. About 30 of Burman's plants were linked with the van der Stel Collection, so Jessop concluded the Pretoria volume was not the one mentioned by Burman.

Jessop, considering the possibility that 'I.P.A.' might be equated with the Witsen Codex quoted by Burman, drew attention to certain discrepancies between them. A few of Burman's plants with quotations from the Witsen Codex cannot be matched in 'I.P.A.'. There are about 4 that can be matched, but which are associated with the van der Stel Collection and not with the Witsen Codex, and there are many cases where 'I.P.A.' lacks some or all of the information quoted from the Codex. These differences can be explained if one assumes Burman had duplicate sets of parts of the Codex series at his disposal, not all with identical notes, and that his reference to the Witsen Codex applied to the whole work, in the sense used by Boerhaave: Only in the case of the van der Stel Collection was he referring to a particular volume. Mention of the Codex in relation to a certain plant would then imply that a painting was present, but the figure and the notes could have come from different paintings of the same species. The remarkable thing is that there is so much agreement—about 95% of the Decades figures and 60% of the notes associated with the Witsen Codex could have been taken from 'I.P.A.'. With this wider concept of the Witsen Codex in mind, we can look afresh at the status of 'I.P.A.' as possibly one of the volumes used by Burman for the 'Decades'.

Where 'I.P.A.' lacks an exact counterpart of a 'Witsen Codex' figure, an alternative painting of the species can be found: *Oxalis purpurea*, t.27 fig. 3 in the 'Decades' matches the painting in the Pretoria volume and not the one of this species in 'I.P.A.', fol. 138, but words quoted from the Codex correspond

with those on the 'I.P.A.' sheet. Two species of *Cryptadenia* have figures in the 'Decades' unlike 'I.P.A.' paintings of the same species. Here again the notes quoted from the Codex are the same as those in 'I.P.A.'.

As evidence of duplication of material in the various Codex volumes, in the description of *Lobelia erinus* L., Burman refers to both the van der Stel Collection and the Witsen Codex. His figure, t.40 fig. 1 matches 'I.P.A.' fol. 255, but was copied from the van der Stel Collection. (Plate 3, fig. 8). When mentioning this Collection, he sometimes added that these paintings were done from living material at the Cape. He would have used these in preference to copies in another volume. This might account for the presence in 'I.P.A.' of these 'Decades' pictures, linked with the van der Stel Collection, and not with the Witsen Codex:—*Pelargonium myrrhifolium* (L.) Ait., t.37 fig. 1 in the 'Decades' with a poor copy in 'I.P.A.', fol. 263:—*Rhus lucida* L. t.91 fig. 2 like fol. 254:—*Cliffortia ruscifolia* L. t.98 fig. 3 like fol. 224, and *Berzelia abrotanoides* L. t.100 fig. 1 like fol. 20 in 'I.P.A.'. Notes are limited to a tentative name or absent in the first 3 in 'I.P.A.'. Only in the last is there information one might have expected Burman to quote.

Two of Burman's references to the Witsen Codex are difficult to relate to a particular painting in 'I.P.A.'. *Phylica stipularis* t.43 fig. 2 is said to be unlike the plant in the Witsen Codex. The only *Phylica* in 'I.P.A.' is *P. plumosa* L. fol. 219. It is clearly not this picture to which he refers. The other species is *Microlooma tenuifolia* (L.) K. Schum., described and figured twice in the 'Decades'. Notes from the Codex and t.15 correspond with 'I.P.A.' fol. 155, but t.16 fig. 1 cannot be matched. These two species were probably taken from a different series to the ones in 'I.P.A.'.

While an appropriate painting can be found to match all save these two plants, there are many cases where information quoted from the Witsen Codex cannot be found in 'I.P.A.'. This is most noticeable in the Namaqualand series. Of 12 plants in the 'Decades', only 3 have wording that agrees completely with 'I.P.A.'. Most of the others correspond with 'S.A.M.', a volume known to have been in Burman's possession at some period, for the notes in it are in his handwriting.

Information was added to the 'I.P.A.' sheets, apparently, on two occasions, first the name and flower colour in a faded ink, then details of locality and time of flowering in a darker ink but the same writing. Apart from the Namaqualand plants, there are about 15 cases where 'I.P.A.' lacks some or all of the information given from the Codex, usually from this latter part of the notes. Alternative paintings of all these must have been in existence. Some conflicting information may be due to corrections of obvious errors: the yellow-flowered *Zygophyllum morganiana* L. fol. 144 called 'coerulea' in 'I.P.A.' is quoted from the Codex as



Fig. 8. *Lobelia erinus* L. Differs from "Decades" t. 40 fig. 1 in having serrate-edged leaves.

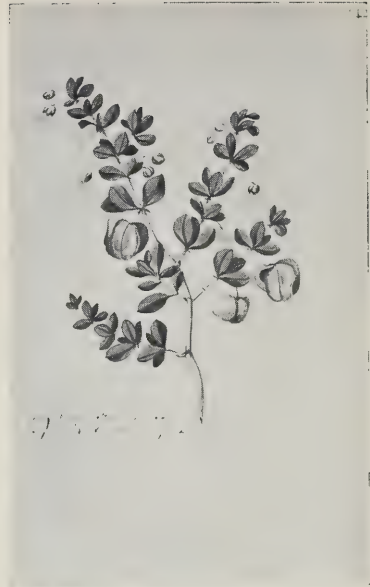


Fig. 9. *Zygophyllum morskana* L. Flowers erroneously described as blue on "I.P.A." fol. 144: Correctly called yellow in "Decades" text with t. 3 fig. 2.



Fig. 10. *Cotyledon ventricosa* Burm. f., "I.P.A." fol. 13, matching Burman's t. 21 fig. 1 in the "Decades".



Fig. 11. *Salvia africana-lutea* L. "I.P.A." fol. 42. One of the many beautiful paintings in the Codex not utilised by Burman in the "Decades": The species was described and illustrated by Commelin from material in the Hortus Medicus, Amsterdam.

Paintings of interest in "I.P.A."



'flava'. (Plate 3, fig. 9). The only inexplicable reference in the 'Decades' is to *Oxalis versicolor* L., the lower picture of fol. 257. It has in 'I.P.A.' notes of flower colour, locality and time of flowering, while Burman says that in the Witsen Codex it is not annotated.

There is no indication whether or not 'I.P.A.' was one of the volumes given by Caspar Commelin's widow to Burman, but the contents point to the probability that it was used by him in the 'Decades' at the same time as 'S.A.M.' and the volume in Pretoria. It is to be hoped that the van der Stel Collection and the Manuscript Catalogue of the Witsen Codex by Caspar Commelin, like 'I.P.A.', 'S.A.M.' and the Pretoria volume, have escaped destruction over the centuries, and that they too will sometime come into the hands of people who appreciate their historical and scientific value.

#### CARL LINNÉ AND THE CAPE FLORA

Three years before the first part of the 'Decades' was published, Burman was glad to enlist the help of a young Swedish botanist commended to him by Boerhaave and others at Leyden University. This was Carl Linné who spent a year in Amsterdam, receiving free board and lodging in Burman's home in exchange for assistance with the collections of exotics in the Amsterdam Gardens and Herbarium. Linné must have studied the venerated Codex volumes with care in that year when visions of a new system for the naming, identification and classification of all plants of the World were crystallising in his mind.

Many 'Decades' plants appear in Linné's 'Species Plantarum' (Ed. I 1753). As he knew Burman's book so well, any omissions may well have been deliberate: for example, *Maytenus acuminatus* (L.f.) Loes., badly drawn in 'I.P.A.' fol. 209, is shown in the 'Decades' with flowers scattered down the stem and not in axillary clusters as they should be (Plate 1, fig. 3). Linné did not quote this figure nor describe the species. In another category is the unmistakable picture of *Podocarpus latifolius* Thunb., fol. 73 in 'I.P.A.' and t.93 in the 'Decades'. This was a female branch, and Linné may have required male cones before it could be adequately described. (Plate 1, fig. 4).

Linné was unable to visit the Cape himself, but his pupil Karl Peter Thunberg travelled extensively in South Africa, finding many plants overlooked by the earlier collectors. His 'Prodromus Capensis' (1794) and 'Flora Capensis' (1807-23) include many species in 'I.P.A.' but not in the 'Species Plantarum', and *Podocarpus latifolius* is one of these. Miller in Britain and Linné himself added many new species to the Cape Flora in their later publications. Nicolaas Burman (1768) also a pupil of Linné, listed many new and old species using the Linnaean system of classification, and giving them binomials in his 'Prodromus Capensis'. It is probable that almost all the plants of Hermann, Oldenland,



Fig. 12. *Protea scolymocephala* Reich., "I.P.A." fol. 25, a beautiful painting, possibly original.



Fig. 13. *Protea lepidocarpodendron* (L.) L., "I.P.A." fol. 31, similar in style to fol. 25.

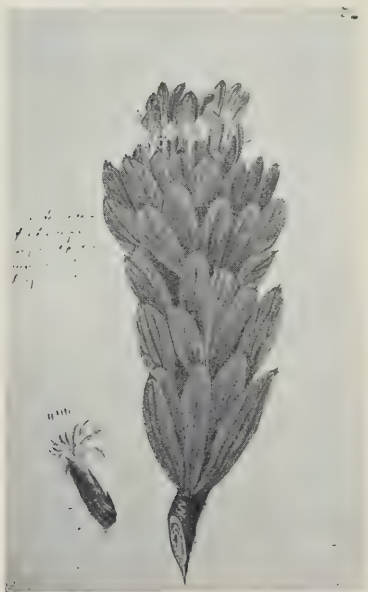


Fig. 14. *Mimites hartogii* R. Br. "I.P.A." fol. 32, in series with the preceding two paintings, but inferior in execution.



Fig. 15. *Protea cynaroides* Thunb. "I.P.A." fol. 215, One of the series with some duplicates in Leyden. The style of painting differs from fol. 25, in "I.P.A." these are probably copies of the originals.

Some paintings of Proteaceae in "I.P.A." Corresponding with illustrations in Boerhaave's "Index Alter Plantarum"; without duplicate paintings in Leyden University.

Hartog, those in 'I.P.A.' and in the 'Decades' were named and described in the lifetime of Linné, and soon after. 'I.P.A.' species given below with authors of more recent times may be wrongly identified, or there may be confusions in modern nomenclature.

#### THE SPECIES IN 'I.P.A.'

Some figures in the 'Decades' taken from the Witsen Codex have been made types for the species. Pothill (1964) selected t.88, Burm., Pl. Afr. as the type for *Celtis africana* Burm. f., while Salter (1944) gives t.74 of Burmann Afr. for *Oxalis pes-caprae* L., and de Winter gives the type of *Euclea racemosa* Murr. as t.84 f. 1 of Burm., Rar. Pl. Afric. (Plate 2, fig. 5, 6, 7). The presence of the originals or copies of them, with the colours of the living plants, enhances the value both of these types and of the 'I.P.A.' paintings from which they were possibly taken. There may be other cases where Codex pictures are the proto-types of recognised type figures.

Where a figure taken from the Codex is quoted in literature, it is possible to give the species of the 'I.P.A.' painting with certainty. This applies to most of the *Proteaceae*, the *Stapelieae*, the *Succulent Euphorbieae*, *Ranunculaceae*, *Zygophyllaceae* and many other individual genera and species. It was fortunate that Dr. Reynolds saw the *Aloe* species in 'I.P.A.' before his death, and that Kennedy was able to publish his determinations. Identifications of some *Proteaceae* by Ion Williams unfortunately missed publication.

The following list is given in Families of plants for the convenience of specialists, for there remains much research to be done on the use made of these paintings by early authors, and citations of these figures in early and later literature.

#### ACKNOWLEDGEMENTS

Dr. Joyce Lewis saw black-and-white photographs of the 'I.P.A.' paintings before she died, and we would like to take this opportunity of expressing our gratitude for the help given by her and Miss W. F. Barker of the Compton Herbarium, Kirstenbosch, with identifications of the Iridaceae and many of the 'difficult' pictures. Our thanks also go to Miss M. Gunn, Librarian of the Botanical Research Institute, Pretoria, for her wise guidance and selfless assistance.

We would like to thank Miss Anna Smith and Mr. R. F. Kennedy of the Africana Museum, Johannesburg for permission to reproduce photographs of the 'I.P.A.' paintings and according us the privilege of working on 'I.P.A.', and to express, on behalf of the botanists of South Africa, appreciation of their service to Science in the publication of a catalogue, with sepia reproductions, and references to corresponding pictures in literature, of all the paintings in 'I.P.A.'.

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# THE CODEX WITSENI

343 Paintings and studies of Cape plants in the volume I.P.A. in the Johannesburg Municipal library, catalogued in the taxonomic sequence of De Dalla Torre and Harmes.

| Fol.<br>No. |                                                       | Fol.<br>No. |                                        |
|-------------|-------------------------------------------------------|-------------|----------------------------------------|
|             | PODOCARPACEAE                                         |             |                                        |
| 73          | Podocarpus latifolius (Thunb.) R.Br.<br>ex Mirb.      | 177         | Haworthia retusa (L.) Haw. var. retusa |
|             | TAXACEAE                                              | 176         | Haworthia submaculata van Poelln.      |
| 283         | Torreya sp. (Exotic)                                  | 320         | Albuca altissima Dryand                |
|             | PINACEAE                                              | 272         | Albuca fragrans Jacq.                  |
| 130         | Widdringtonia cupressoides (L.) Endl.                 | 325         | Ornithogalum suaveolens Jacq.          |
|             | CYPERACEAE                                            | 307         | Veltheimia glauca Jacq.                |
| 171         | Sickmannia radiata (L.f.) Nees                        | 268         | Lachenalia ?glauca Jacq.               |
|             | LILIACEAE                                             | 321         | Lachenalia hirta Thunb.                |
| 278         | Wurmbea spicata (Burm.) Dur. &<br>Schinz var. spicata | 134         | Lachenalia pendula Ait.                |
| 319         | Wurmbea spicata (Burm.) Dur. &<br>Schinz var. spicata | 316         | Asparagus capensis L.                  |
| 271         | Bulbine alooides (L.) Willd.                          | 35          | Asparagus exuvialis Burch.             |
| 8           | Kniphofia uvaria (L.) hook. f.                        | 36          | Asparagus ?thunbergensis Schult. f.    |
| 289         | Aloe arenicola Reynolds                               |             |                                        |
| 3           | Aloe brevifolia Mill. var. brevifolia                 |             |                                        |
| 2           | Aloe brevifolia Mill. var. depressa<br>(Haw.) Bak.    |             |                                        |
| 290         | Aloe dichotoma Masson                                 |             |                                        |
| 184         | Aloe falcata Bak.                                     |             |                                        |
| 185         | Aloe falcata Bak.                                     |             |                                        |
| 174         | Aloe ferox Mill.                                      |             |                                        |
| 175         | Aloe ferox Mill.                                      |             |                                        |
| 179         | Aloe glauca Mill.                                     |             |                                        |
| 1           | Aloe humilis (L.) Mill.                               |             |                                        |
| 291         | Aloe khamiesensis Pillans                             |             |                                        |
| 288         | Aloe melanacantha Berger                              |             |                                        |
| 4           | Aloe plicatalis (L.) Mill.                            |             |                                        |
| 5           | Aloe plicatalis (L.) Mill.                            |             |                                        |
| 187         | Aloe ?saponaria (Ait.) Haw.                           |             |                                        |
| 180         | Aloe ?succotrina Lam.                                 |             |                                        |
| 181         | Aloe ?succotrina Lam.                                 |             |                                        |
| 6           | Gasteria disticha (L.) Haw.                           |             |                                        |
| 186         | Gasteria disticha (L.) Haw.                           |             |                                        |
| 182         | Haworthia herbacea (Mill.) Stearn                     |             |                                        |
| 7           | Haworthia ?integra van Poelln.                        |             |                                        |
| 172         | Haworthia margaritifera (L.) Haw.                     |             |                                        |
| 173         | Haworthia pallida Haw. var. pallida                   |             |                                        |
| 178         | Haworthia ?papillosa (Salm.) Haw.                     |             |                                        |
|             | AMARYLLIDACEAE                                        |             |                                        |
|             |                                                       | 135         | Haemanthus ?rotundifolius Gawl         |
|             |                                                       | 53          | Haemanthus undulatus Herb.             |
|             |                                                       | 139         | Amaryllis belladonna L.                |
|             |                                                       | 324         | Brunsvigia appendiculata Leighton      |
|             |                                                       | 266         | Empodium plicatum Bak.                 |
|             |                                                       | 330         | Walleria armata Schltr.                |
|             | IRIDACEAE                                             |             |                                        |
|             |                                                       | 109         | Moraea ?bituminosa (L.f.) Ker          |
|             |                                                       | 108         | Moraea decussata Klatt                 |
|             |                                                       | 107         | Moraea edulis (L.f.) Ker               |
|             |                                                       | 111         | Moraea edulis (L.f.) Ker               |
|             |                                                       | 112         | Moraea edulis (L.f.) Ker               |
|             |                                                       | 305         | Moraea edulis (L.f.) Ker               |
|             |                                                       | 110         | Hexaglottis flexuosa Sweet             |
|             |                                                       | 116         | Aristea capitata (L.) Ker              |
|             |                                                       | 117         | Aristea capitata (L.) Ker              |
|             |                                                       | 161         | Aristea sp.                            |
|             |                                                       | 119         | Ixia ciliaris L.                       |
|             |                                                       | 114         | Ixia dubia Vent.                       |
|             |                                                       | 115         | Tritonia crispa Ker                    |
|             |                                                       | 318         | Tritonia crispa Ker                    |
|             |                                                       | 113         | Tritoniopsis parviflora (Jacq.) Lewis  |
|             |                                                       | 323         | Babiana tubata Sweet                   |
|             |                                                       | 304         | Gladiolus alatus L.                    |
|             |                                                       | 118         | Gladiolus blandus Ait.                 |
|             |                                                       | 303         | Gladiolus carinatus Ait.               |
|             |                                                       | 270         | Gladiolus gracilis Jacq.               |
|             |                                                       | 269         | Gladiolus ?maculatus Sweet             |
|             |                                                       | 322         | Lapeirousia anceps Ker                 |

- Fol.  
No.
- ORCHIDACEAE
- 106 *Satyrion carneum* (Dryand) R.Br.  
136 *Disa cornuta* (L.) Swartz  
137 *Disperis capensis* (L.f.) Swartz
- ULMACEAE
- 72 *Celtis africana* Burm. f.
- MORACEAE
- 333 *Ficus cordata* Thunb.  
344 ?*Ficus cordata* Thunb.
- PROTEACEAE
- 64 *Brabeium stellatifolium* L.  
37 *Serruria burmanni* R.Br.  
34 *Serruria glomerata* (L.) R.Br.  
32 *Mimetes hartogii* R.Br.  
23 *Mimetes hirta* (L.) Knight  
125 *Mimetes lyrigera* Knight  
249 *Diaetella proteoides* (L.) Druce  
212 *Protea acaulis* Thunb.  
27 *Protea arborea* Houtt.  
28 *Protea arborea* Houtt.  
215 *Protea cynaroides* Thunb.  
216 *Protea cynaroides* Thunb.  
31 *Protea lepidocarpodendrum* (L.) L.  
30 *Protea macrocephala* Thunb.  
124 *Protea repens* (L.) L.  
126 *Protea scorzonifolia* (Salsb. ex Knight) Ryecroft  
25 *Protea scolymocephala* Reich.  
24 *Protea speciosa* L.  
127 *Leucospermum conocarpodendrum* (L.) Buck  
128 *Leucospermum hypophyllum* R.Br.  
211 *Leucadendron argenteum* (L.) R.Br.  
213 *Leucadendron coniferum* (L.) Druce  
218 *Leucadendron floridum* R.Br.  
243 *Leucadendron levisianum* (L.) Berg.  
217 *Leucadendron rubrum* Burm. f.  
26 *Leucadendron xanthocornum* (O. Ktze.) K.Schum.  
29 *Leucadendron xanthocornum* (O. Ktze.) K.Schum.
- PHYTOLACCACEAE (or AIZOACEAE)
- 293 *Limeum capense* Thunb.
- AIZOACEAE
- 195 ?*Pharnaecium* sp.  
19 *Aizoon sarmentosum* L.f.
- FICOIDACEAE (or AIZOACEAE sect. MESEMBRIANTHEMAE)
- 196 *Carpobrotus edulis* (L.) N.E.Br.  
197 *Carpobrotus edulis* (L.) N.E.Br.  
339 *Conophytum* sp.  
193 *Glottiphyllum linguiforme* (L.) N.E. Br.
- Fol.  
No.
- 201 *Lampranthus emarginatus* (L.) N.E. Br. var. *emarginatus*  
202 *Mesembrianthemum crystallinum* L.  
194 *Ruschia filamentosa* (L.) L.Bol.  
326 *Sceletium* sp.
- RANUNCULACEAE
- 47 *Anemone capensis* (L.) L.  
58 *Knowltonia capensis* (L.) Huth  
59 *Knowltonia capensis* (L.) Huth
- LAURACEAE
- 66 *Cinnamomum camphora* Nees & Eberm. (Exotic)
- CRUCIFERAE
- 329 *Heliophila* sp.
- CAPPARIDACEAE
- 334 *Polanisia lutea* Sond.
- CRASSULACEAE
- 9 *Cotyledon decussata* Sims. var.  
292 *Cotyledon decussata* Sims. var.  
132 *Cotyledon grandiflora* Burm. f.  
199 *Cotyledon orbiculata* L. var. *orbiculata*  
11 *Cotyledon paniculata* L.f.  
12 *Cotyledon paniculata* L.f.  
13 *Cotyledon ventricosa* Burm.f. var. *ventricosa*  
203 *Rochea coccinea* (L.) DC.  
10 *Andromischus caryophyllaceus* (Burm.f.) Less.
- SAXIFRAGACEAE
- 104 *Montinia caryophyllacea* (Burm.f.) Less.  
105 *Montinia caryophyllacea* (Burm.f.) Less.  
311 *Montinia caryophyllacea* (Burm.f.) Less.
- CUNONIACEAE
- 63 *Cunonia capensis* L.  
204 *Cunonia capensis* L.
- BRUNIACEAE
- 60 *Staavia glutinosa* Dahl  
129 *Brunia nodiflora* L.  
20 *Berzelia abrotanoides* (L.) Brong  
214 *Berzelia lanuginosa* (L.) Brong
- ROSACEAE
- 224 *Cliffortia ?ruscifolia* L.  
49 *Grielum grandiflorum* (L.) Druce
- LEGUMINOSAE
- 343 *Acacia karroo* Hayne  
68 *Virgilia oroboides* (Berg.) Salter

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|---------------------------------------------|---------------------------------------------------|
| Fol.<br>No.                                 | Fol.<br>No.                                       |
| 229 Podalyria biflora (Retz.) Lam.          | 144 Zygophyllum morgsana L.                       |
| 227 Podalyria calypttrata (Thunb.) Willd.   | 14 Zygophyllum sessilifolium L.                   |
| 226 Liparia sphaerica L.                    | 16 Zygophyllum spinosum L.                        |
| 228 Borbonia cordata L.                     |                                                   |
| 236 ?Borbonia cordata L.                    | RUTACEAE                                          |
| 230 Borbonia lanceolata L.                  | 57 Agathosma ciliata (L.) Link.                   |
| 98 Rafnia humilis E. & Z.                   | 244 Adenandra umbellata Willd.                    |
| 235 Rafnia humilis E. & Z.                  | 56 Diosma hirsuta L.                              |
| 93 Rafnia triflora Thunb.                   |                                                   |
| 97 Lotononis prostrata (L.) Benth.          | POLYGALACEAE                                      |
| 256 Lotononis prostrata (L.) Benth.         | 92 Muraltia heisteria (L.) DC                     |
| 299 Lebeckia cytisoides Thunb.              | 200 Muraltia serpyllodes DC                       |
| 301 Lebeckia cytisoides Thunb.              | 99 Nylandia spinosa Dam.                          |
| 231 Lebeckia ?plukenetiana E. Mey.          | 232 Nylandia spinosa Dam.                         |
| 233 Aspalathus ?acuminatus Lam.             | 314 Nylandia spinosa Dam.                         |
| 225 Aspalathus araneosus L.                 | 338 Nylandia spinosa Dam.                         |
| 162 Aspalathus commutatus (Vog.) R. Dahlgr. |                                                   |
| 94 Aspalathus macranthus Harv.              | EUPHORBIACEAE                                     |
| 44 Aspalathus spinosus L.                   | 192 Euphorbia arceuthobioides Boiss               |
| 159 Aspalathus spinosus L.                  | 120 Euphorbia caput medusae L. var. caput medusae |
| 234 Aspalathus ?tridentatus L.              | 190 Euphorbia caput medusae L. var. caput medusae |
| 237 Aspalathus variegatus E. & Z.           | 183 Euphorbia clandestina Jacq.                   |
| 71 Indigofera cytisoides Thunb.             | 308 Euphorbia hamata Sweet                        |
| 62 Indigofera filiformis Thunb.             | 310 Euphorbia loricata Lam.                       |
| 342 Indigofera psoraloides L.               | 337 Euphorbia mauritanica L.                      |
| 55 Tephrosia capensis Pers.                 | 191 Euphorbia puginiformis Boiss.                 |
| 95 Lessertia miniata Salter                 | 302 Euphorbia stellaespinia Haw.                  |
| 96 Lessertia sp.                            | 188 Euphorbia tridentata Lam.                     |
| 273 Dolichos decumbens Thunb.               | 189 Euphorbia tuberosa L.                         |
| 152 Dolichos gibbosus Thunb.                |                                                   |
|                                             | ANACARDIACEAE                                     |
| GERANIACEAE                                 | 315 Ozoroa argentea (Thunb.) Fernandez            |
| 348 Sarcaulon sp.                           | 61 Rhus augustifolia L.                           |
| 22 Pelargonium betulinum (L.) Ait.          | 254 Rhus lucida L.                                |
| 296 Pelargonium bifolium (Burm.f.) Willd.   |                                                   |
| 295 Pelargonium echinatum Curt.             | AQUIFOLIACEAE                                     |
| 21 Pelargonium ferulaceum Willd.            | 205 Ilex mitis (L.) Radlk.                        |
| 294 Pelargonium fulgidum Willd.             | 208 Ilex mitis (L.) Radlk.                        |
| 298 Pelargonium fulgidum Willd.             |                                                   |
| 261 Pelargonium ?hirsutum (Burm.f.) Ait.    | CELASTRACEAE                                      |
| 262 Pelargonium longifolium Jacq.           | 141 ?Maytenus acuminata (L.f.) Loes.              |
| 263 Pelargonium myrrhifolium (L.) Ait.      | 209 Maytenus acuminata (L.f.) Loes.               |
| 297 Pelargonium trifidum (Burm.f.) Willd.   | 148 Putterlickia pyracantha (L.) Endl.            |
| 264 Pelargonium triste (L.) Ait.            | 140 Pterocelastrus tricuspidatus Sond.            |
|                                             | 74 Cassine capensis L.                            |
| OXALIDACEAE                                 |                                                   |
| 257a Oxalis flava L. formae                 | SAPINDACEAE                                       |
| 258 Oxalis flava L. forma pectinata Sond.   | 327 Erythrophysa alata Hutch.                     |
| 259 Oxalis pes caprae L.                    |                                                   |
| 138 Oxalis purpurea L.                      | BALSAMINACEAE                                     |
| 257b Oxalis versicolor L.                   | 279 ?Impatiens sp. (Exotic)                       |
| 260 Oxalis sp.                              |                                                   |
| LINACEAE                                    | RHAMNACEAE                                        |
| 275 Linum africanum L.                      | 220 Noltea africana (L.) Reichb. f.               |
| ZYGOPHYLLACEAE                              | 219 Phylica plumosa L.                            |
| 149 Zygophyllum fulvum L.                   |                                                   |

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|-------------|----------------------------------------|-------------|-------------------------------------------------------------|
| Fol.<br>No. |                                        | Fol.<br>No. |                                                             |
|             | VITACEAE                               |             |                                                             |
| 156         | Rhoicissus capensis (Burm.f.) Planch.  | 313         | Diospyros austro africana de Winter<br>var. austro africana |
|             | TILIACEAE                              | 131         | Diospyros glabra (L.) de Winter                             |
| 157         | Grewia occidentalis L.                 | 340         | Diospyros ?glabra (L.) de Winter                            |
|             | MALVACEAE                              | 223         | Diospyros whyteana (Hiern) F. White.                        |
| 52          | Hibiscus diversifolius Jacq.           |             | OLEACEAE                                                    |
| 281         | Hibiscus sp. (Exotic)                  | 70          | Linociera foveolata (E. Mey.) Knobl.<br>subsp. foveolata    |
|             | STERCULIACEAE                          | 76          | Jasminum sp. (Exotic)                                       |
| 221         | Hermannia diffusa L.f.                 | 65          | Olea africana Mill.                                         |
| 222         | Hermannia hyssopifolia L.              | 210         | Olea africana Mill.                                         |
|             | PENAEACEAE                             | 69          | Olea capensis L. subsp. capensis                            |
| 80          | Penaea mucronata L.                    |             | GENTIANACEAE                                                |
|             | OLINIACEAE                             | 46          | Chironia linoidea L.                                        |
| 67          | Olinia cymosa (L.f.) Thunb.            |             | ASCLEPIADACEAE                                              |
|             | THYMELIACEAE                           | 155         | Microloma tenuifolium (L.) K.Schum.                         |
| 248         | Gnidia pinifolia L.                    | 306         | Xysmalobium undulatum R.Br.                                 |
| 252         | Gnidia sericea (L.) L.                 | 331         | Asclepias fruticosa L.                                      |
| 245         | Struthiola ciliata (L.) Lam.           | 154         | Cyanchum obtusifolium L.f.                                  |
| 246         | Struthiola ciliata (L.) Lam.           | 18          | Caralluma incarnata (L.f.) N.E.Br.<br>var. incarnata        |
| 101         | Cryptadenia grandiflora (L.f.) Meisn.  | 17          | Stapelia hirsuta L. var. hirsuta                            |
| 102         | Cryptadenia uniflora (L.) Meisn.       | 123         | Stapelia variegata L. var.                                  |
|             | UMBELLIFERAE                           | 317         | (Asclepiadaceae)                                            |
| 54          | Hermas capitata L.f.                   |             | BORAGINACEAE                                                |
| 121         | Arctopus echinatus L.                  | 100         | Lobostemon fruticosus (L.) Buek                             |
| 206         | Arctopus echinatus L.                  |             | LABIATAE                                                    |
| 280         | Sium sp. (Exotic) ?ninsi L.            | 33          | Ballota africana (L.) Buek                                  |
| 282         | Sium sp. (Exotic) ?ninsi L.            | 277         | Stachys aethiopica L.                                       |
| 332         | Annesorrhiza sp.                       | 43          | Salvia africana caerulea L.                                 |
| 300         | Peucedanum sp.                         | 42          | Salvia africana lutea L.                                    |
|             | CORNACEAE                              |             | SOLANACEAE                                                  |
| 75          | Curtisia dentata (Burm.f.) C. S. Smith | 145         | Lycium afrum L.                                             |
|             | ERICACEAE                              | 143         | Solanum guineense L.                                        |
| 79          | Erica baccans L.                       | 142         | Solanum ?guineense L.                                       |
| 165         | Erica bauera Andrews                   | 150         | Solanum quadrangulare Thunb.                                |
| 84          | Erica caffra L.                        | 151         | Solanum tomentosum L.                                       |
| 167         | Erica caffra L.                        | 39          | Datura metel L. (Exotic)                                    |
| 164         | Erica grandiflora L.f.                 |             | SCROPHULARIACEAE                                            |
| 81          | Erica halicacaba. L.                   | 312         | Nemesia bicornis Pers.                                      |
| 82          | Erica halicacaba. L.                   | 345         | Nemesia cheiranthus E. Mey                                  |
| 83          | Erica ?imbricata L.                    | 146         | Halleria lucida L.                                          |
| 166         | Erica mammosa L.                       | 147         | Halleria elliptica Thunb.                                   |
| 250         | Erica phyllaefolia Salisb.             | 335         | Manulea benthamiana Hiern                                   |
| 251         | Erica plukenetii L.                    | 247         | Manulea cheiranthus L.                                      |
| 85          | Erica urna viridis Bolus               | 133         | Hyobanche sanguinea L.                                      |
|             | SAPOTACEAE                             |             | MYOPORACEAE                                                 |
| 163         | Sideroxylon inerme L.                  | 103         | Oftia africana (L.) Berg.                                   |
|             | EBENACEAE                              |             | RUBIACEAE                                                   |
| 328         | Euclea natalensis A.DC.                | 45          | Oldenlandia capensis L.f.                                   |
| 158         | Euclea racemosa J. A. Murray           | 207         | Gardenia jasminoides Ellis (Exotic)                         |
|             |                                        | 274         | Canthium inerme (L.f.) S. Moore                             |



| Fol.<br>No. |                                     | Fol.<br>No. |                                              |
|-------------|-------------------------------------|-------------|----------------------------------------------|
|             | CURCUBITACEAE                       |             |                                              |
| 153         | Kedrostis nana (Lam.) Cogn.         | 90          | Senecio elegans L.                           |
|             |                                     | 15          | Senecio sp.                                  |
|             | CAMPANULACEAE                       | 240         | Euryops abrotanifolia (L.) DC.               |
| 41          | Wahlenbergia exilis A.DC.           | 241         | Euryops ?pectinatus (L.) Cass.               |
| 267         | Cyphia bulbosa (L.) Berg.           | 48          | Othonna bulbosa L.                           |
| 347         | Cyphia digitata Willd.              | 198         | Othonna dentata L.                           |
| 276         | Lobelia coronopifolia L.            | 336         | Othonna leptodactyla Harv.                   |
| 255         | Lobelia erinus L.                   | 309         | Gamolepis speciosa Pillans                   |
| 38          | Lobelia pinifolia L.                | 265         | Dimorphotheca nudicaulis (L.) DC.            |
| 40          | Monopsis lutea (L.) Urb.            | 86          | Osteospermum ilicifolium L.                  |
|             |                                     | 169         | Osteospermum spinosum L. var.<br>spinosum    |
|             | COMPOSITAE                          | 170         | Chrysanthemoides monilifera (L.) T.<br>Norl. |
| 160         | Corymbium ?glabrum L.               | 89          | Ursinia sp.                                  |
| 346         | Pteronia sp.                        | 238         | Haplocarpha calendula (L.) Levyns            |
| 88          | Felicia amelloides (L.) Voss        | 341         | Gorteria sp.                                 |
| 122         | Helichrysum foetidum (L.) Moench    | 239         | Gazania ?pinnata (Thunb.) Less.              |
| 78          | Metalasia muricata (L.) Don.        | 91          | Cullumia biscula (Thunb.) Less.              |
| 253         | Relhania ericoides (Berg.) Cass.    | 242         | Cullumia setosa (L.) R.Br.                   |
| 168         | Osmitopsis asteriscoides (L.) Cass. | 50          | Gerbera asplenifolia (Lam.) Spreng.          |
| 87          | Cineraria geifolia L.               | 51          | Gerbera crocea (L.) O.Ktze.                  |